THERMOTRON INDUSTRIES

Holland, Michigan

Ref

INSTRUCTION MANUAL

- For -

TELEDYNE SYSTEMS

THERMOTRON PORTABLE TEMPERATURE CONDITIONER

Model ETS-150-LN_2

Serial No. 21-8962

2/27/80

THE THERMOTRON INSTRUCTION MANUAL

Thermotron instruction manuals are dedicated to assisting the reader-user toward a better understanding of Thermotron Environmental Chambers and associated equipment. Most instruction manuals are seldom read except in the time of crisis when equipment malfunction is suspected. When this happens, the manual is usually missing, or at best, difficult to locate. So to start things off on the right foot, WHY NOT FIND A CONVENIENT SPOT TO KEEP THIS MANUAL?

We at Thermotron have tried to produce a usable manual. But being human, we are subject to frailties of behavior. Therefore, should you discover any errors or omissions, or should you wish to contribute any recommendations, send us your comments. We at Thermotron will be most appreciative.

WARNING

PRODUCT PROTECTION

When operating this chamber with a live load (heat dissipating product) or a dead load, auxiliary protection should be provided by the operator (customer). Provision must be made to remove power from the product on test and the chamber in the event the chamber temperature exceeds a predetermined safe limit for the product within the chamber.

Thermotron chambers are equipped with high heat limit, or safety devices. These safety devices are installed to protect the chamber from exceeding design limits. These safety devices remove power ONLY from the chamber heaters and DO NOT remove power from your product; therefore, a device such as the THERMOTRON PRODUCTSAVER, or equivalent, must be used to remove power from the product and the chamber should an "out of tolerance" condition occur.

The PRODUCTSAVER is designed with concealed setpoints for high and low temperatures. These can be precisely set at a temperature limit to permit safe operations. Power to the product and a circuit interrupting power to the chamber must both be wired through the output relays of the PRODUCTSAVER. The PRODUCTSAVER will then shut down chamber operation and product operation within the safe operating temperature limits of the product, either hot or cold.

RECOMMENDED SPARE PARTS LIST

Part No.	Computer No.	Nomenclature	Qty Per Chamber
7560K5	565773	Switch, Toggle	1
7500K14	565765	Switch, Toggle	1
MRA-1-5	555190	Switch, Selector	1
AB1R042N	569175	Motor, Blower	1
WUV	533995	Links, Heat	2
1050QA1	566109	Lamp	1
EL-1137-1	541238	Heater	1
319B134Q1C	563207	Timer, Delay	1
151008	151008	Thermocouple	1
8262B210LT	549255	Solenoid, LN_2	1
D2410	555735	Relay, Solid State	1
D2425	555751	Relay, Solid State	1

GENERAL DESCRIPTION

This manual is provided to acquaint the operator with the Thermotron equipment. A study of the electrical schematic will enable an understanding of how the various conditions and control functions are performed. Thermotron engineering and technology are built into each assembly of environmental test equipment. This assures dependable performance of specified functions. Minimum maintenance will be achieved through periodic checks and proper care.

The Thermotron Model ETS-150-LN_2 is designed to control and indicate temperature through the entire range.

The Thermotron ETS-150-LN_2 is a portable temperature conditioning system with flexible duct and fittings. It is used to condition a separate test chamber for the customer's specific requirements. The outlet temperature is measured at the outlet of the chamber by means of the controlling thermocouple located in the supply duct. Temperatures above ambient are obtained by the high or low heating capacity inside the conditioning compartment. Conditioned air is delivered to the test enclosure through the insulated supply duct.

Low temperatures are accomplished by LN_2 injection into the conditioning compartment. The conditioned air is then delivered to the test enclosure through the insulated duct.

GENERAL DESCRIPTION

The conditioner is designed to operate on 115 volt, 15 ampere, 60 hertz alternating current. Any standard source of power may be used.

The equipment is mounted in a welded steel housing. Removable enclosure panels permit services access to all the components of the system. Table space for the environmental temperature conditioner itself is 18 by 10 inches. The lower section of the Thermotron equipment houses the heaters, air recirculator, and connections for supply and return air.

INSTALLATION INSTRUCTIONS:

ELECTRICAL: Refer to electrical schematic and provide 115 V.A.C., 20 amp power supply.

LN_2 COOLING: Connect a clean, dry supply of LN_2 at 30 P.S.I. to the inlet side of the LN_2 control solenoid valve. (Insulate the piping from the supply to the chamber LN_2 valve.)

NOTE: A high pressure relief valve should be connected to this line to relieve pressure if LN_2 is trapped in the line.

INSTRUMENTATION:

The cooling instrumentation of this chamber consists of a Thermotron Controller, a Newport Digital Pyrometer, three Thermotron digital set point potentiometers, and two 3 position selector switches. Refer to the electrical schematic in this manual to become familiar with the interconnection and system tie-in. Refer to the instrument instruction manuals for installation and service instructions.

ELECTRICAL

All electrical components are contained in the upper section of the unit. All wiring is identified. The circuits are protected by fuses, The electrical system meets N.E.M.A. Standards.

A high heat limit switch is wired in the electrical circuit of the unit. This high heat limit is designed to prevent the chamber from exceeding the maximum operating temperature limit.

As more positive protection against over temperature conditions, heat links have been wired in series with the chamber heaters. The heat links will fuse (open) if the chamber temperature reaches +154°C (+310°F) (Not Resettable, Replace)

There are two heaters in this unit. One heater is operated directly by controller demands. (Low heat for control purposes). The second heater is delayed from energizing for 1.6 to 100 seconds* by a delay timer. Both heaters energized provides high heat for fast temperature changes.

* The amount of delay is operator adjustable.

OPERATING INSTRUCTIONS

These operating instructions will tell the operator what must be done to place the chamber in operation. A thorough study of the electrical schematic and operating instructions should be made to become proficient in operating this chamber.

1. Place the ETS-150 on a solid, level structure.
2. Dial the desired operating temperature for each of the three potentiometers. These settings may be selected from the Percentage of Span tables.
3. Position the set point selector switch to select the applicable digital set point potentiometer.
4. Turn the Pilot switch ON.
5. Turn the Heat switch ON.
6. Turn the Cool switch ON.

NOTE: The thermocouple selector switch may be turned to the SUPPLY, RETURN, or REMOTE position in order to read the applicable temperature on the meter.

PREVENTIVE MAINTENANCE

In the day to day operation of this equipment, you will become aware of certain levels of noise, vibration, temperature, and pressure. If you encounter any significant changes in these levels, investigate them immediately.

It is also recommended that the following be performed monthly.

1. ELECTRICAL PANEL:

   Check for components and wires that may vibrate loose during operation. Check for signs of contactor or relay arcing. Check to assure that the power and ground connections remain secure.

2. OPERATING CURRENTS:

   With an amprobe, check the operating current of the heaters, blower, and other components. These values are shown on the electrical schematic.

COPPER VS. COPPER-NICKEL
(COPPER-CONSTANTAN)

TEMPERATURE IN DEGREES F

RANGE -125° TO +375°F

PERCENT OF ABSOLUTE MILLIVOLT SPAN

DEG F	0	1	2	3	4	5	6	7	8	9	10	DEG F
												120
120	0070	0067	0062	0058	0054	0000						110
110	0215	0199	0185	0170	0156	0143	0128	0114	0099	0085	0070	100
100	0380	0346	0331	0316	0302	0288	0272	0258	0243	0229	0215	
90	0510	0495	0480	0465	0450	0435	0420	0405	0390	0376	0360	90
80	0662	0647	0632	0617	0601	0586	0571	0555	0540	0525	0510	80
70	0817	0801	0786	0770	0755	0739	0724	0708	0693	0678	0662	70
60	0975	0958	0943	0928	0912	0895	0880	0864	0849	0833	0817	60
50	1135	1119	1103	1087	1071	1055	1039	1023	1007	0990	0975	50
40	1298	1282	1266	1249	1233	1217	1200	1184	1168	1152	1135	40
30	1464	1447	1431	1414	1397	1381	1364	1348	1331	1315	1298	30
20	1632	1615	1598	1581	1565	1548	1531	1514	1497	1481	1464	20
10	1804	1787	1769	1752	1735	1718	1701	1683	1666	1649	1632	10
0	1977	1960	1942	1925	1907	1890	1872	1855	1838	1821	1804	0
0	1977	1994	2012	2029	2047	2065	2083	2100	2117	2135	2153	0
10	2153	2171	2189	2208	2224	2242	2260	2278	2295	2314	2332	10
20	2332	2350	2368	2385	2404	2422	2440	2458	2476	2495	2513	20
30	2513	2530	2549	2568	2585	2604	2622	2641	2659	2677	2696	30
40	2696	2714	2732	2751	2769	2788	2806	2825	2843	2862	2881	40
50	2881	2899	2918	2936	2955	2974	2992	3011	3030	3048	3067	50
60	3067	3087	3105	3124	3143	3161	3181	3199	3218	3238	3256	60
70	3256	3275	3294	3314	3332	3352	3371	3390	3409	3428	3448	70
80	3448	3466	3486	3505	3525	3544	3563	3583	3602	3622	3641	80
90	3641	3661	3680	3700	3719	3739	3758	3778	3797	3817	3836	90
100	3836	3857	3876	3896	3915	3935	3954	3974	3995	4014	4035	100
110	4035	4054	4074	4094	4114	4134	4154	4175	4194	4214	4235	110
120	4235	4254	4275	4295	4315	4336	4356	4375	4396	4416	4437	120
130	4437	4457	4477	4498	4518	4539	4559	4580	4600	4621	4641	130
140	4641	4662	4682	4703	4724	4744	4765	4786	4808	4827	4848	140
150	4848	4869	4889	4911	4931	4952	4973	4994	5015	5036	5057	150
160	5057	5078	5099	5120	5141	5162	5184	5204	5225	5246	5268	160
170	5268	5289	5310	5331	5353	5374	5396	5417	5438	5459	5481	170
180	5481	5502	5524	5545	5567	5588	5609	5631	5653	5675	5696	180
190	5696	5718	5739	5761	5782	5804	5825	5848	5870	5891	5913	190
200	5913	5936	5957	5978	6000	6022	6044	6066	6088	6110	6132	200
210	6132	6154	6176	6198	6220	6242	6264	6287	6309	6331	6353	210
220	6353	6375	6397	6420	6442	6464	6486	6509	6531	6553	6576	220
230	6576	6598	6620	6643	6665	6688	6710	6733	6755	6778	6801	230
240	6801	6823	6846	6868	6891	6913	6936	6958	6981	7004	7027	240
250	7027	7049	7072	7096	7118	7141	7164	7186	7209	7232	7256	250
260	7256	7278	7301	7324	7347	7370	7393	7415	7439	7462	7486	260
270	7486	7508	7531	7554	7577	7600	7624	7647	7670	7694	7716	270
280	7716	7740	7763	7787	5520	7833	7856	7880	7903	7927	7950	280
290	7950	7973	7997	8020	8044	8067	8091	8114	8138	8162	8185	290
300	8185	8209	8232	8256	8279	8303	8327	8351	8374	8398	8422	300
310	8422	8446	8469	8493	8517	8541	8564	8588	8613	8636	8660	310
320	8660	8684	8708	8732	8756	8780	8804	8828	8852	8876	8900	320
330	8900	8924	8948	8972	8997	9021	9045	9069	9094	9117	9142	330
340	9142	9166	9190	9215	9238	9263	9288	9311	9336	9361	9385	340
350	9385	9409	9434	9458	9483	9507	9532	9557	9580	9605	9629	350
360	9629	9654	9678	9703	9728	9752	9777	9802	9827	9852	9876	360
370	9876	9901	9925	9950	9975	9999						370
DEG F	0	1	2	3	4	5	6	7	8	9	10	DEG F

TYPE T PER ASA C96.1-1971

*CONVERTED FROM ASA TEMP. VS. EMF TABLES (THERMOTRON 1972)

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COPPER VS. COPPER-NICKEL
(COPPER-CONSTANTAN)

TYPE T

TEMPERATURE IN DEGREES C

RANGE -87°C TO +190°C

PERCENT OF ABSOLUTE MILLIVOLT SPAN

DEG C	0	1	2	3	4	5	6	7	8	9	10	DEG C
												80
80	0185	0159	0133	0108	0082	0057	0031	0006				70
70	0450	0423	0398	0370	0343	0316	0290	0264	0237	0211	0185	60
60	0724	0696	0668	0641	0613	0586	0558	0531	0504	0477	0450	50
50	1007	0978	0950	0921	0893	0864	0836	0808	0779	0751	0724	
40	1298	1269	1240	1210	1180	1152	1123	1093	1064	1035	1007	40
30	1598	1568	1539	1508	1478	1447	1418	1387	1358	1328	1298	30
20	1907	1876	1845	1814	1783	1752	1721	1690	1659	1629	1598	20
10	2224	2192	2160	2129	2096	2065	2033	2001	1970	1938	1907	10
0	2549	2516	2483	2450	2418	2385	2353	2321	2288	2256	2224	0
0	2549	2582	2615	2648	2681	2714	2747	2780	2813	2846	2880	0
10	2880	2913	2947	2981	3014	3048	3082	3116	3150	3184	3218	10
20	3218	3253	3286	3321	3355	3390	3424	3459	3493	3528	3563	20
30	3563	3598	3633	3668	3703	3738	3773	3809	3844	3879	3915	30
40	3915	3950	3986	4022	4058	4094	4130	4166	4202	4238	4274	40
50	4274	4311	4347	4384	4420	4457	4494	4530	4567	4604	4640	50
60	4640	4678	4715	4752	4790	4827	4864	4902	4939	4977	5014	60
70	5014	5053	5090	5128	5166	5203	5242	5280	5318	5357	5395	70
80	5395	5433	5471	5510	5549	5588	5627	5666	5704	5743	5782	80
90	5782	5821	5861	5900	5939	5978	6017	6056	6096	6136	6175	90
100	6175	6215	6256	6295	6335	6374	6414	6456	6496	6536	6575	100
110	6575	6616	6656	6696	6737	6778	6818	6859	6900	6941	6981	110
120	6981	7022	7064	7104	7145	7186	7227	7269	7310	7351	7393	120
130	7393	7434	7476	7517	7559	7600	7643	7684	7726	7768	7810	130
140	7810	7852	7894	7936	7978	8020	8062	8105	8147	8190	8232	140
150	8232	8275	8318	8360	8407	8446	8488	8531	8575	8617	8660	150
160	8660	8703	8746	8789	8833	8876	8919	8962	9006	9049	9093	160
170	9093	9136	9180	9223	9268	9311	9356	9399	9443	9487	9531	170
180	9531	9575	9619	9663	9708	9752	9797	9841	9885	9930	9974	180
190	9974											190
DEG C	0	1	2	3	4	5	6	7	8	9	10	DEG C

TYPE T PER ASA C96.1-1971

*CONVERTED FROM ASA TEMP. VS. EMF TABLES (THERMOTRON 1972)

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HOW TO USE THE PERCENTAGE OF SPAN TABLE

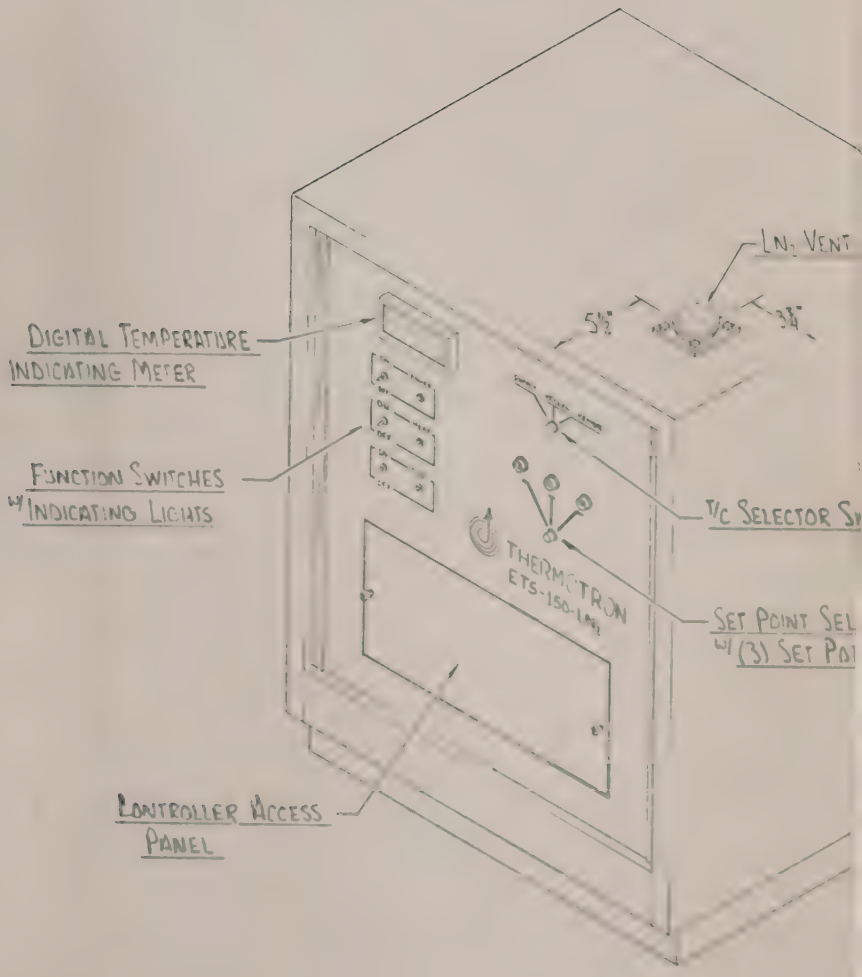
This table has been provided as a quick reference in determining the dial setting of the digital set points in relationship to the corresponding temperature of the controller.

In this case, the digital set point is divided into incremental settings of one one-thousandths (1/1000) and is spread over a 500° span (-125°F. to +375°F.).

Thus to find the digital setting that is equivalent to 200°F., you look down the degree F. column to +200 and across to the zero vertical column. This indicates that a digital setting of .591 will give a controller set point temperature of 200°F. Similarly to find an equivalent digital setting for 205°F., you look down the degree F. column to 200 and go across to unit column 5. (This represents 205°F.) The figure 602 is the corresponding digital settings for a 205°F. temperature. The fourth digit may be used to round the third digit in the dial setting. For any fourth digit of 5 or more, add one number to the third digit of the dial setting; for any fourth digit of less than five no change is made in the third digit dial setting.

For example, if the digital number is .5057 (160°F.), you would round the dial setting to 506. If the digital setting were .4994 (157°F.) you would set the dial for 499.

NOTE: This percentage of span table does not apply to the slope rate control digital set pot.



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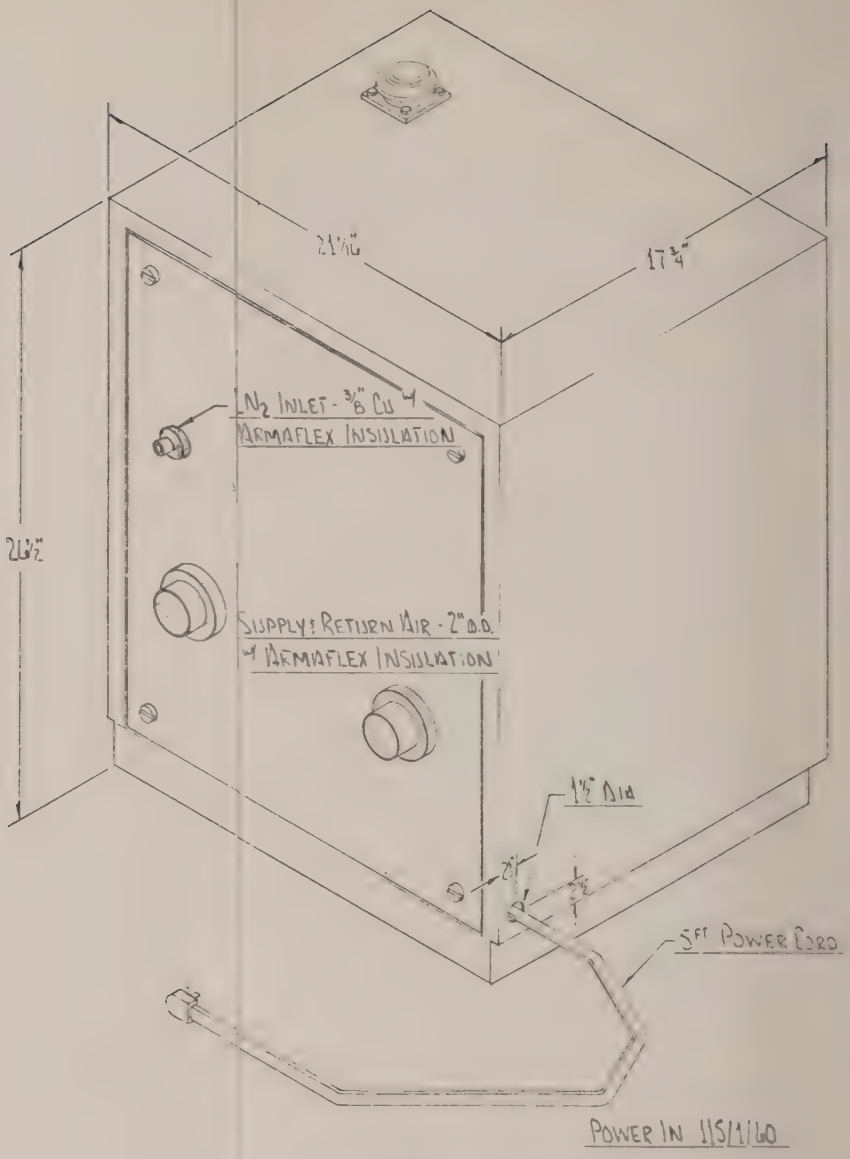


DESCRIPTION	
MODEL ETS-150-	
ASSEMBLY	
DRAWING NO. 5054	X

THERMOTRON CORPORATION

Job 21-8962 Model ETS-150-LN$_2$ Voltage 115/1/60 Sheet 1 of 8 CAB

OPERATION SHEET METAL ASSEMBLY MACHINERY B/M

DESCRIPTION	MFG	PART NO	THERM NO	MAKE	QTY	R/M
ASSEMBLY		5254(X)	607576	DWG		
CONDITIONING ASSEMBLY		5254-1(X)	607584	DWG		
FLANGED PORTS		5254-1(X)	607789	W.O.	2	
2" ODx4½" LGx.049 TUBING SS		5254-1(X)	549859	W.O.	2 PCS	
1/4"ODx1"LGx.049 WALL TUBING SS		5254-1(X)	549751		2 PCS	
FLANGE 2" IDx2½"ODx.062 THK		5254-1(X)	550067	W.O.	2 PCS	
OUTER SHELL		5254-1(X)	607886	W.O.	1	
16 GA PTLK			545535		4.192	SQ FT
INNER BODY LINER		5254-1(X)	607894	W.O.	1	
16 GA SS			550067		3.15	SQ FT
COVER PLATE		5254-1(X)	607908	W.O.	1	
16 GA PTLK			545535		.52	SQ FT
1/4"-20 SS THREADED RODx2½"LG		5254-1(X)	581884		8	
1/4"-20 SS NUTS HEX		5254-1(X)	533030S		8	
CONDITIONING SECTION COVER		5254-3(X)	607614	DWG		
COVER		5254-3(X)	607967	W.O.	1	
16 GA PTLK			545535		1.785	SQ FT
COVER TAPPING PLATES		5254-3(X)	607957	W.O.	2	
10 GA CFS		5254-3(X)	548836		.069	SQ FT
FLANGE (MOTOR PORT & EXHAUST PORT)		5270-5-2(Y)	532560	W.O.	2	
TUBING 1" ODx1½" LG SS		5254-3(X)	549719	W.O.	1	
TUBING 1" ODx2½" LG SS		5254-3(X)	549719	W.O.	1	
LINER		5254-3(X)	607959	W.O.	1	
16 GA SS			550067		1.288	SQ FT
VENT ASSEMBLY ADAPTOR		5254-4(Y)	607630	W.O.	1	
16 GA SS 2½"x2½"		5254-4(Y)	550067		7	SQ IN
TUBING 1" ODx2"LG		5254-4(Y)	549719		1	
BLOWER BAFFLE		5254-6(Y)	607673	W.O.	1	
16 GA SS			550067		.246	SQ FT

THERMOTRON CORPORATION

21-8962 Model ETS-150-LN_2 Voltage 115/1/60 Sheet 2 of 8 CAB

[illegible] CABINET ASSEMBLY CHAMBER B/M

DESCRIPTION	MFG	PART NO	THERM NO	MAKE	QTY	R/M
DOUBLE "P" GASKET		1611(Z)	560550		4	
.25x20 SCREWS			576813		8	
FOAM INSULATION			528654		.5	GAL
LN_2 EXHAUST ASSEMBLY			607983		1	
1" OD SS TUBING			549719		.188	FT
MOTOR PORT KIT			607991		1	
1"x1.25 SS TUBING			549719		.104	FT
INSULATION			558742		1	
SOLENOID		8262B210	549255		1	
INSULATION		5254-20(Y)	158769	DWG	1.365	FT
BLOWER			582646		1	
VENT ASSEMBLY		5254-4(Y)	607622	DWG	1	
VENT		502	569299		1	
CLAMP		6416	557789		2	
DUCT		581-15	582638		1	
MOTOR ASSEMBLY		5254-5(Y)	608092	DWG	1	
MOTOR		AB1R042N#	569175	REF	1	
SEALING WASHER		5246-8-2	607567	MAKE	1	
SPONGE MATERIAL			568020		.055	FT
SEAL		5247-11-5(Y)	607665	MAKE	1	

THERMOTRON CORPORATION

JOB 21-8962 Model FTS-150-LN2 Voltage 115/1/60 Sheet 3 of 8 CAB

OPERATION SHEET METAL ASSEMBLY CABINET B/M

DESCRIPTION	MFG	PART NO	THERM NO	MAKE	QTY	R/M
CONSOLE ASSEMBLY		5254-7(Y)	607681	DWG	1	
CONSOLE BASE		5254-7-1(Y)	607703	W.O.	1	
16 GA PTLK			545535		3.84 SQ FT	
CONSOLE TOP		5254-7-2(Z)	607711	W.O.	1	
16 GA PTLK			545535		3.227 FT	
SIDE PANEL		5254-7-3(X)	607738	W.O.	2	
16 GA PTLK			545535		4.43 FT	
GUSSETS		5254-7(Y)	607754	W.O.	4	
10 GA CFS			548836		.043 FT	
DOOR		5254-7-4(Z)	607746	W.O.	1	
16 GA PTLK			545535		3.40 FT	
CONSOLE BOTTOM SPACER		1923-3(Z)	597139	W.O.	1	
16 GA PTLK			545535		.7 SQ FT	

THERMOTRON CORPORATION

Job 21-8962 Model ETS-150-LN$_2$ Voltage 115/1/60 Sheet 4 of 8 CAB

OPERATION SHEET METAL ASSEMBLY CONSOLE B/M

DESCRIPTION	MFG	PART NO	THERM NO	MAKE	QTY	R/M
PANEL SILK SCREEN		5254-16(X)	607843	DWG	1	
FRONT PANEL		5254-13(X)	607851	W.O.	1	
12 GA CFS			548852		2.771	FT
GUSSETS LH		5254-2(Y)	607940	W.O.	1	
10 GA CFS			548836		1.088	FT
GUSSET RH		5254-2(Y)	607592	W.O.	1	
10 GA CFS			548836		1.088	FT
CONTROLLER MTG BRACKET		5254-12(Z)	607827	W.O.	1	
16 GA PTLK			545535		1.404	FT
TAP PLATE 7 3/8"x3 3/8"			608289	W.O.	2	
10 GA CFS			548836		.053	FT
ACCESS PANEL		5254-15(Z)	607835	W.O.	1	
12 GA CFS			548852		.577	FT
TAP PLATES				W.O.	2	
10 GA CFS 1 1/8"x2"			548836		4	SQ IN

THERMOTRON CORPORATION

Job 21-8912 Model PTS-150-LN_2 Voltage 115/1/60 Sheet 5 of 8 CAB

OPERATION SHEET METAL ASSEMBLY POWER PANEL B/M

DESCRIPTION	MFG	PART NO	THERM NO	MAKE	QTY	R/M
ELECTRICAL ENCLOSURE		5254-14(X)	607878	W.O.	1	
ELECTRICAL ENCLOSURE TOP			608432	W.O.	1	
16 GA PTLK			545535		2.078	FT
ELECTRICAL ENCLOSURE BOTTOM			608440	W.O.	1	
16 GA PTLK			545535		1.913	FT

THERMOTRON CORPORATION

JOB 21-8962 Model ETS-150-LN_2 Voltage 115/1/60 Sheet 6 of 8 CAB

OPERATION CABINET ASSEMBLY ELECTRICAL B/M

DESCRIPTION	MFG	PART NO	THERM NO	MAKE	QTY	R/M
ELECTRICAL DWG		E55-8-1(X)		DWG		
CONTROLLER		012003	Q12003		1	
METER			53.420		1	
SWITCH			565773		1	
SWITCH			565765		2	
PILOT LAMP			566109		3	
DIGITAL SET POTS		054011	054011		3	
SWITCH(SELECTOR)			555190		2	
COVER TO FRONT PANEL DETAIL		5254-9(X)		DWG(REF)		
THERMOCOUPLES		151008	51008		4	
TERMINAL			545374		18	
FUSE			576031		1	
FUSE			576228		1	
BLOCK			553155		2	
POWER CORD			534584		1	
RELAY			555751		1	
RELAY			555735		1	
HEAT LINKS(2+2 SPARES)			533995		4	
TIMER			563207		1	
SOCKET			567814		1	
CAPACITOR		062008	062008		1	
STRIP			553090		1	
HEATER		EL1137-1(X)	541238	W.O.	1	
THERMOSTAT			582670		1	

THERMOTRON CORPORATION

Job 21-8962 Model ETS-150-LN_2 Voltage 115/1/60 Sheet 7 of 8 CAB

OPERATION CABINET ASSEMBLY ELECTRICAL B/M

DESCRIPTION	MFG	PART NO	THERM NO	MAKE	QTY	R/M
HOSE			564181		.063	FT
HEATER INSTALLATION		5254-10(Y)		DWG(REF)		
ELECTRICAL DWG ETS-150				REF		

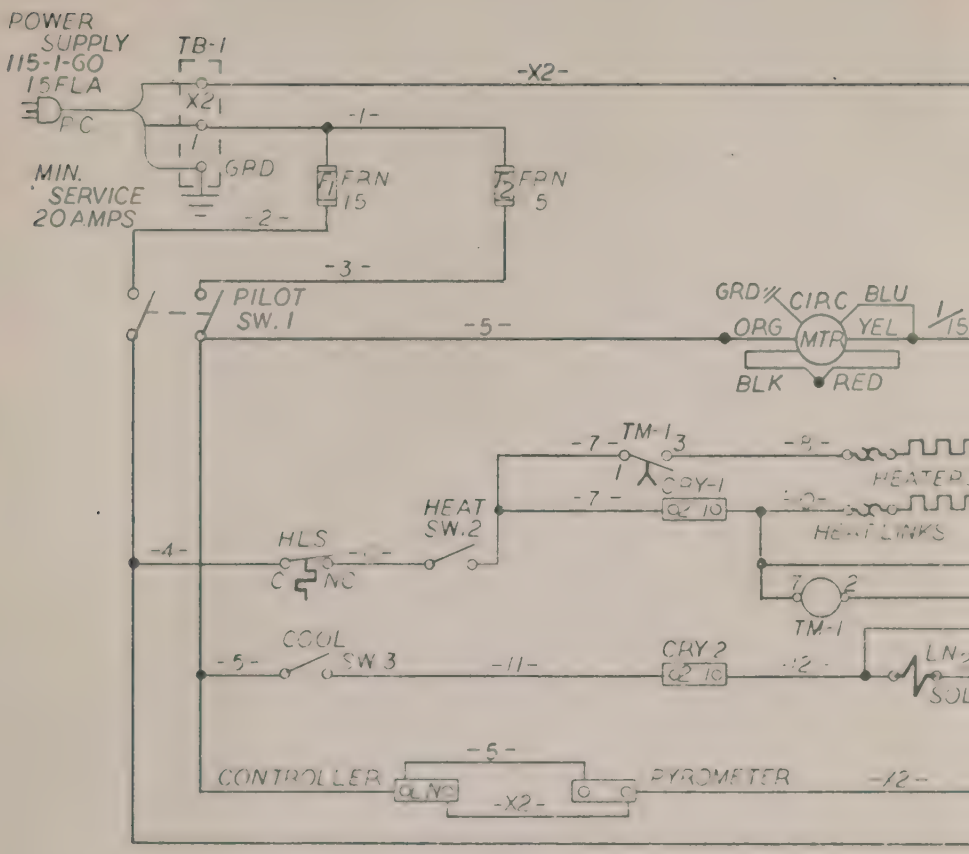
THERMOTRON CORPORATION

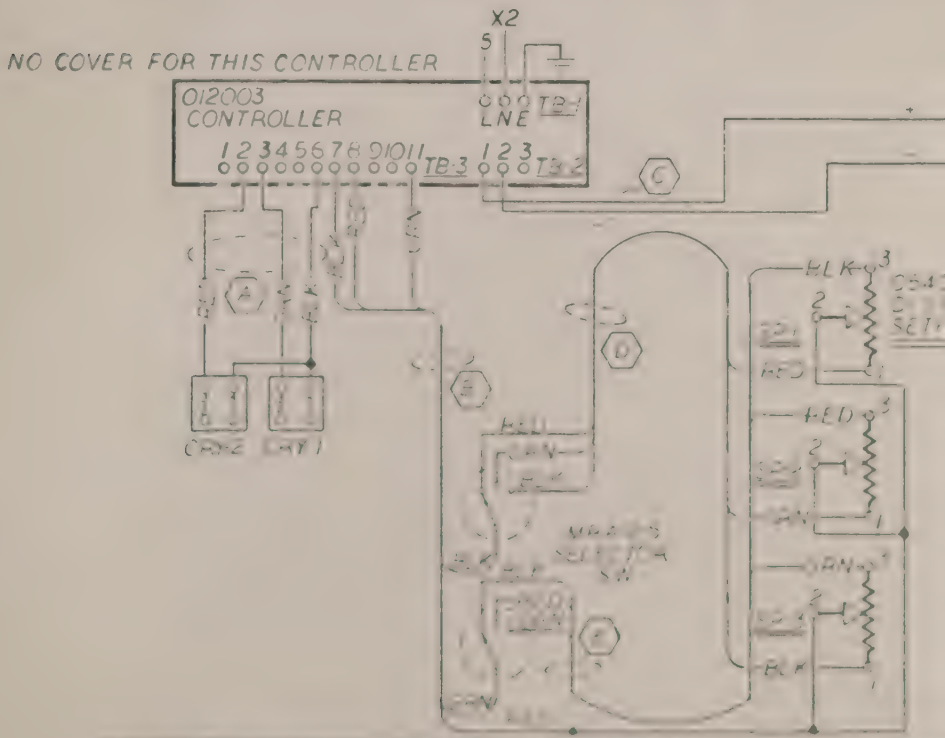
Job 21-8962 Model ETS-150-LN_2 Voltage 115/1/60 Sheet 8 of 8 CAB

OPERATION CABINET ASSEMBLY ACCESSORY B/M

DESCRIPTION	MFG	PART NO	THERM NO	MAKE	QTY	R/M
FASTENERS		ORB-7500-12-CA	545390		2	
KNURLED HEAD FASTENER	SOUTHCO	1713-714-11	563940		4	
WASHER	SOUTHCO	17-10014-12	563975		4	
SPEED NUT	SOUTHCO	17-10015-14	563983		4	
INSULATION ARMAFLEX		5254-8(Y)	558947	DWG	1	
INSULATION ARMAFLEX		5254-8(Y)	558912	DWG	1	
TUBING 1/4" COPPER		5254-11(Y)	577690	DWG	2	
TRIM STRIPS		98-50-1200-13	539705		2	
RETAINERS		SERIES 50	539713		12	
*FEATURE DUCT ETS-150-LN_2			608459		1	
DUCT OPT ETS-150-LN_2			608467		1	
DUCT			582662		2	
HOSE CLAMP SS		6432	557800		4	

*AS REQ'D FOR CUSTOMER ORDER





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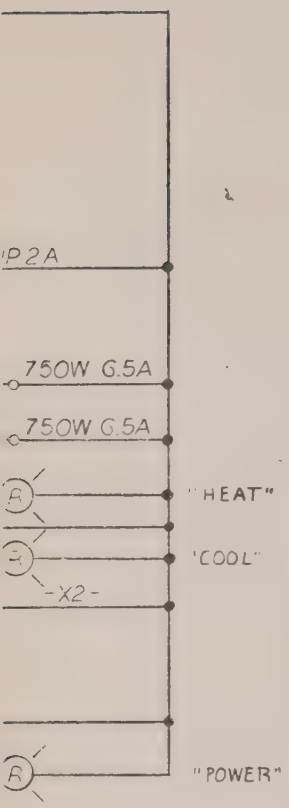
HOLLAND, MICHIGAN 49423



LU — #151008
ED — T/C 4

I
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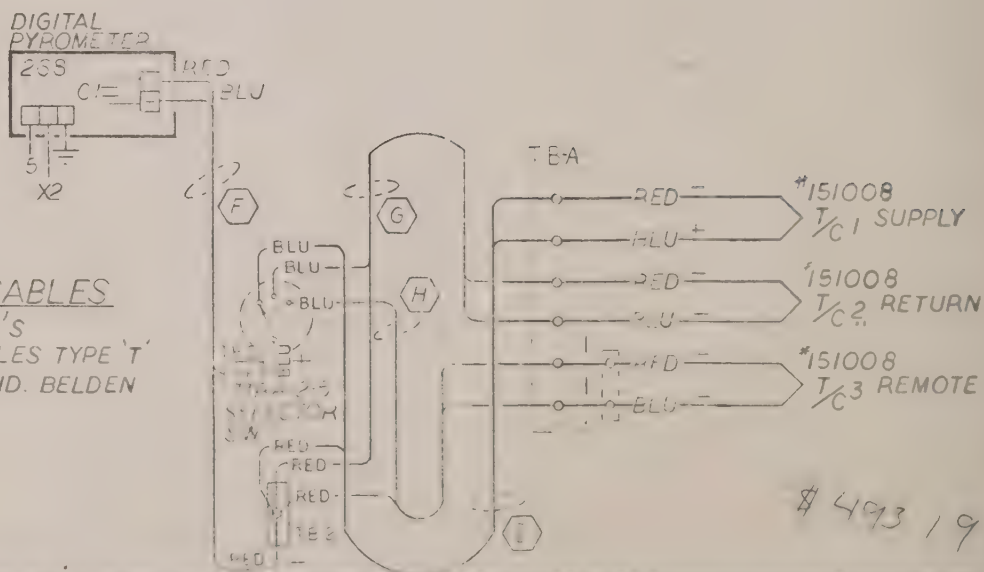


INTERCONNECT CABLES

C,G,H,I	#151008 T/C'S
F	T/C EXT. CABLES TYPE 'T'
A,B,D,E	8443 3 COND. BELDEN

493 19

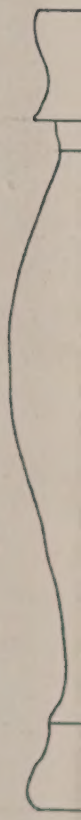
DESCRIPTION	ETS-150-LN2 ELECTRICAL DWG. JOB
E-[illegible]-1-	

THERMOTRON CORPORATION

Job _____ Model ETS-150-LN_2 STANDARD Voltage 115/1/60 Sheet 1 of 1 EL

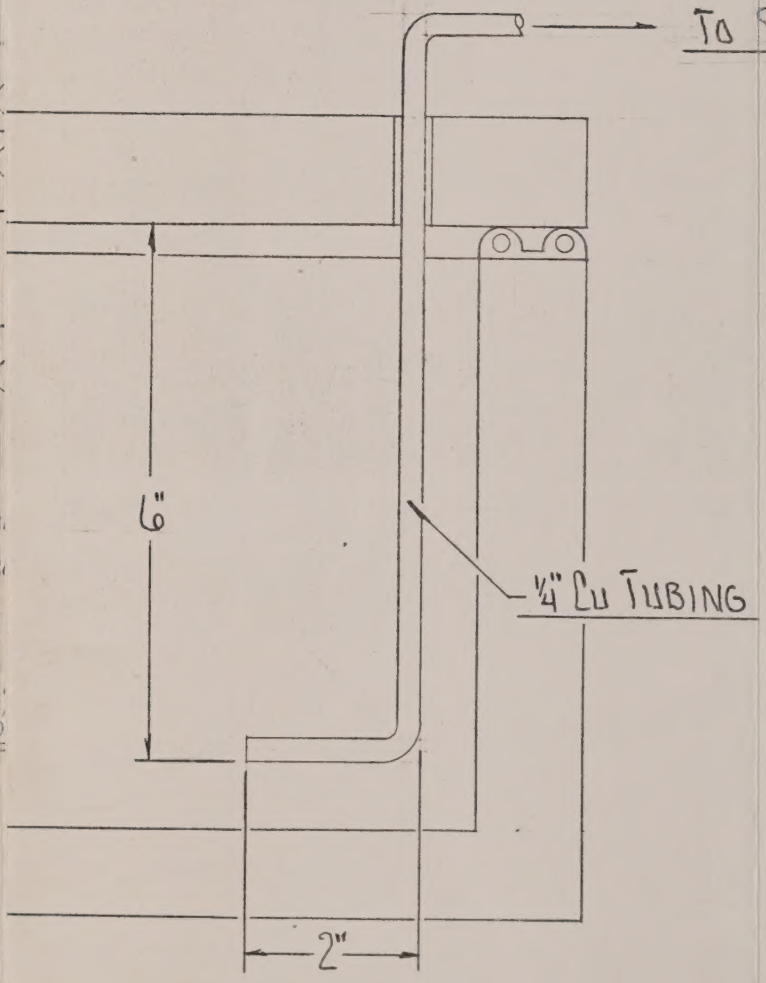
OPERATION ELECTRICAL ASSEMBLY _____ B/M _____

SYMBOL	DESCRIPTION	MFG	PART NO	THERM NO	QTY	R/M
ELECTRICAL DWG	ELECTRICAL DWG STANDARD		E55-8-1(X)		DWG	
TB 1	POWER CONTROL TERMINALS	SQUARE D	9080KCA1	565412	18	
TB KIT	TERMINAL END KIT	SQUARE D	9080K1	590355	2	
F 1	HEATER FUSE	BUSS	FRN 15	576031	1	
F 2	CONTROL FUSE	BUSS	FRN 5	576288	1	
FUSE BLK	FUSE BLOCK 1P 30A 250V	MARATHON	F30A1SP	553155	2	
SW 1	DPST TOGGLE SWITCH	C H	7560K5	565773	1	
SW 2,3	SPST TOGGLE SWITCH	C H	7500K14	565765	2	
P.C.	POWER CORD	NEWARK	36F1295	534584	1	
SELECT SW	THERMOCOUPLE SELECTOR SWITCH	ALCO	MRA-2-5	555190	2	
CRY 1	SOLID STATE RELAY 25A	CRYDOM	D2425	555751	1	
CRY 2	SOLID STATE RELAY 10A	GORDON	GB15410-2	569450	1	
HEAT LINKS	HEAT LINKS 310°F(2+2 SPARES)	BUSS	WUV	533995	4	
R	NEON PILOT LAMP 125V	IND DEV	1050QA1	566109	3	
HEATERS	.75W HEATERS	THERMOTRON	EL1137-1-X	541238	1	
TM 1	TIMER 1.6 TO 100 SEC	ATC	319B134Q1C	563207	1	
HLS	HIGH HEAT LIMIT SET 300°F	BURLING	A-1S-UL-L	582670	1	
PYROMETER	METER -130 TO +400°C	NEWPORT	268TC1-D1	531420	1	
SOCKET	8 PIN RELAY SOCKET	CURTIS	RS8-SC	567814	1	
CONTROLLER	CONTROLLER	THERMOTRON	012003	012003	1	
SET POTS	5K DIGITAL SET POTS	THERMOTRON	054011	054011	3	
T/C 1-4	THERMOCOUPLES	THERMOTRON	151008	151008	4	
C 1	.1 MFD 50V CAPACITOR	THERMOTRON	062008	062008	1	
TABS	ITEMS: 88,89,220,221	THERMOTRON	2901	544320	1 EA	
TB 2	SENSOR TERMINAL STRIP	CURITS	E-8	553090	1	



SYM	DATE	CHANGE
A		
B		

DRAWN BY	DATE	SCALE	APPR
DSBARKEL	28 FEB 77	—	



SYM	DATE	CHANGE	BY
C			
D			

MATERIAL: AS SHOWN

THERMOTRON CORP.
HOLLAND, MICHIGAN U.S.A.

DESCRIPTION: LN_2 INLET DETAIL

FOR:

DRAWING NO. 5254-11

SIZE Y